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Patent/TM/App/Serial # 10, 527, 238

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

PATENT MAINTENANCE
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In application of

Hideaki NISHIWAKI et al.

Serial No. ~~40/523,238~~

Filed March 9, 2005

MAGNETO-RESISTIVE ELEMENT AND METHODS OF MANUFACTURING AND USING
THE SAME

[Corresponding to PCT/JP03/11687

Filed September 13, 2002]

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OFFICE

10,527,238 B.M.

REQUEST FOR REFUND

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Applicants respectfully request a refund of \$360.00 charged to Deposit Account No. 23-0975 on August 22, 2005. The charge is for multiple dependent claims and the applicants assert it is incorrect.

Applicants' attorney submitted a Preliminary Amendment (copy enclosed) on March 9, 2005, at the time of filing. It deleted all multiple dependencies in order to reduce the filing fee.

Kindly credit the refund of \$360.00 to the deposit account of undersigned, no. 23-0975. If there are any questions regarding this matter, please contact Kara Reade, Accounting Assistant, at (202) 721-8226.

Respectfully submitted,

Hideaki NISHIWAKI et al.

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March 10, 2006

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2005_0234A



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

:

Hideaki NISHIWAKI et al.

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Mail Stop: PCT

Serial No. NEW

:

Attorney Docket No. 2005_0234A

Filed March 9, 2005

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MAGNETO-RESISTIVE ELEMENT AND
METHODS OF MANUFACTURING AND
USING THE SAME

COPY

[Corresponding to PCT/JP03/11687

Filed September 12, 2003]

PRELIMINARY AMENDMENT

Commissioner for Patents

P.O. Box 1450

Alexandria, VA 22313-1450

Sir:

Please amend the above-identified application as follows.

Amendment to the Title

Please amend the title as follows:

**MAGNETO-RESISTIVE ELEMENT AND METHODS OF ~~MANUFACTURING~~
MANUFACTURING AND USING THE SAME**

Amendments to the Specification

Please replace the paragraph beginning at page 6, line 23, with the following rewritten paragraph:

According to another aspect of the present invention, there is provided a magneto-resistive element including: a substrate, a metal artificial lattice film in which a magnetic thin film and a non-magnetic metal thin film are alternately laminated in at least two layers on a part of this substrate and formed into a predetermined pattern; and a protective layer covering the metal artificial lattice film on the substrate. The magnetic thin film is an alloy film made of nickel (Ni), iron (Fe), and cobalt (Co). As for the percentage composition of the materials based on the number of atoms, nickel (Ni) ranges from 1 to 5 atomic%, cobalt (Co) ranges from 50 to 95 atomic %, and the residue is iron.

Please replace the paragraph beginning at page 9, line 4, with the following rewritten paragraph:

Further, in the magneto-resistive element of the present invention, the amount of sodium ions (Na^+), potassium ions (K^+), and chlorine ions (Cl^-) contained in the first protective layer is up to 10 ~~ppm~~ ppm each. This content can prevent changes in the resistance and magnetic characteristics of the metal artificial lattice film caused by the entry of these ions.

Amendments to the Claims:

1. (Original) A magneto-resistive element comprising:

a substrate;

a metal artificial lattice film in which a magnetic thin film and a non-magnetic metal thin film are alternately laminated in at least two layers on a part of this substrate and formed into a predetermined pattern;

a first protective layer covering the metal artificial lattice film on the substrate;
and

a second protective layer formed on the first protective layer;

wherein residual stress of the first protective layer is substantially zero, and the second protective layer is made of a material rejecting water.

2. (Original) The magneto-resistive element of claim 1, wherein the magnetic thin film is made of an alloy containing nickel (Ni), iron (Fe) and cobalt (Co), and the non-magnetic metal thin film is made of one of copper (Cu) and silver (Ag).

3. (Currently amended) A magneto-resistive element comprising:

a substrate;

a metal artificial lattice film in which a magnetic thin film and a non-magnetic metal thin film are alternately laminated in at least two layers on a part of this substrate and formed into a predetermined pattern; and

a protective layer covering the metal artificial lattice film on the substrate;

wherein the magnetic thin film contains nickel (Ni), iron (Fe), and cobalt (Co), and in percentage composition based on the number of atoms, nickel (Ni) ranges from 1 to 5 atomic%, cobalt (Co) ranges from 50 to 95 atomic %, and a residue is iron.

4. (Original) The magneto-resistive element of claim 3, wherein the magnetic thin film is an alloy film having a composition ratio based on the number of atoms of nickel (Ni): cobalt (Co): iron (Fe) = 4: 90: 6.

5. (Currently amended) The magneto-resistive element of claim 3 ~~or 4~~, wherein the non-magnetic metal thin film is made of one of copper (Cu) and silver (Ag).

6. (Currently amended) The magneto-resistive element of ~~any one of claims 3 through 5~~ claim 3, wherein the protective layer comprises a first protective layer formed on the substrate including the metal artificial lattice film, and a second protective layer formed on the first protective layer, residual stress of the first protective layer is substantially zero, and the second protective layer is made of a material rejecting water.

7. (Currently amended) The magneto-resistive element of claim 1 ~~or 6~~, wherein the first protective layer is made of one of silicon monoxide (SiO), silicon dioxide (SiO₂), silicon nitride (SiN_x), and silicon oxynitride (SiON), and the second protective layer is made of polyimide.

8. (Currently amended) The magneto-resistive element of ~~any one of claims 1 through 4~~ claim 1, wherein magnetic strain of the magnetic thin film is zero.

9. (Currently amended) The magneto-resistive element of claim 1 ~~or 3~~, wherein the substrate is made of ceramics.

10. (Original) The magneto-resistive element of claim 9, wherein the substrate is a glazed ceramic substrate having a glass glazed thereon, and the metal artificial lattice film is formed on the glass layer.

11. (Original) The magneto-resistive element of claim 10, wherein an amount of sodium ions (Na^+), potassium ions (K^+), and chlorine ions (Cl^-) contained in the glass layer is up to 10 ppm each.

12. (Currently amended) The magneto-resistive element of claim 1, ~~6, or 7~~, wherein an amount of sodium ions (Na^+), potassium ions (K^+), and chlorine ions (Cl^-) contained in the first protective layer is up to 10 ~~ppm~~-ppm each.

13. (Original) A method of manufacturing a magneto-resistive element comprising the steps of:

forming a metal artificial lattice film having a predetermined pattern in which a magnetic thin film and a non-magnetic metal thin film are alternately laminated in at least two layers on a part of a substrate;

forming a first protective layer covering the artificial lattice film on the substrate and having a residual stress of substantially zero; and

forming a water-rejecting second protective layer on the first protective layer.

14. (Original) The method of manufacturing a magneto-resistive element of claim 13, wherein the metal artificial lattice film is made of alternately laminating the magnetic thin film and the non-magnetic metal thin film, the magnetic thin film is an alloy made of nickel (Ni), cobalt (Co), and iron (Fe), in percentage composition based on the number of atoms, nickel (Ni) ranges from 1 to 5 atomic%, cobalt (Co) ranges from 50 to 95 atomic %, and a residue is iron, and the non-magnetic metal film is made of one of copper (Cu) and silver (Ag).

15. (Original) The method of manufacturing a magneto-resistive element of claim 13, wherein the step of forming the first protective layer includes forming one of silicon monoxide (SiO), silicon dioxide (SiO_2), silicon nitride (SiN_x), and silicon oxynitride (SiON) by one of

sputtering and physical vapor deposition processes with a temperature of the substrate set in a range of 200 to 250°C.

16. (Currently amended) The magneto-resistive element of claim 1 ~~or 3~~, wherein the magneto-resistive element is used in an environment of at least 150°C.

17. (Currently amended) A method of using a magneto-resistive element, wherein the magneto-resistive element of claim 1 ~~or 6~~ is used in an environment of at least 150°C.

18. (New) The magneto-resistive element of claim 6, wherein the first protective layer is made of one of silicon monoxide (SiO), silicon dioxide (SiO₂), silicon nitride (SiN_x), and silicon oxynitride (SiON), and the second protective layer is made of polyimide.

19. (New) The magneto-resistive element of claim 3, wherein magnetic strain of the magnetic thin film is zero.

20. (New) The magneto-resistive element of claim 3, wherein the substrate is made of ceramics.

21. (New) The magneto-resistive element of claim 20, wherein the substrate is a glazed ceramic substrate having a glass glazed thereon, and the metal artificial lattice film is formed on the glass layer.

22. (New) The magneto-resistive element of claim 20, wherein an amount of sodium ions (Na⁺), potassium ions (K⁺), and chlorine ions (Cl⁻) contained in the glass layer is up to 10 ppm each.

23. (New) The magneto-resistive element of claim 6, wherein an amount of sodium ions (Na^+), potassium ions (K^+), and chlorine ions (Cl^-) contained in the first protective layer is up to 10 ppm each.

24. (New) The magneto-resistive element of claim 3, wherein the magneto-resistive element is used in an environment of at least 150°C .

25. (New) A method of using a magneto-resistive element, wherein the magneto-resistive element of claim 6 is used in an environment of at least 150°C .

REMARKS

The above claim amendments are presented in order to: (1) effect the Article 34 Amendments presented in the international phase (on pages 6 and 9 of the specification, and in claims 3 and 12); (2) correct a spelling error in the title; and (3) delete multiple claim dependencies, so as to reduce the required filing fee.

Respectfully submitted,

Hideaki NISHIWAKI et al.

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March 9, 2005

PATENT APPLICATION SERIAL NO. 10/527238

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE
FEE RECORD SHEET

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01 FC:1631	300.00 OP
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